

WHAT IS CLAIMED IS:

1. A thin film electrode for forming an ohmic contact in light emitting diodes or laser diodes, comprising:

5 a first electrode layer laminated on a p-type gallium nitride layer and including a Ni-X solid solution; and

a second electrode layer laminated on the first electrode and including at least one element selected from the group consisting of Au, Pt, Pd, Ni, Ru, Rh, Re, C, Cu and Ir.

10 2. The thin film electrode according to claim 1, further comprising a third electrode layer laminated on the second electrode layer and including at least one element selected from the group consisting of Al, Ag and Rh.

15 3. The thin film electrode according to claim 1, further comprising a third electrode layer laminated on the second electrode layer and including at least one element selected from the group consisting of transparent conductive oxides and
20 transparent conductive nitrides.

25 4. The thin film electrode according to claim 3, further comprising a fourth electrode layer laminated on the third electrode layer and including at least one element selected from the group consisting of Al, Ag and Rh.

5. A thin film electrode for forming an ohmic contact in light emitting diodes or laser diodes, comprising:

a first electrode layer laminated on a p-type gallium nitride layer and including at least one element selected from the group consisting of Au, Pt, Pd, Ni, Ru, Rh, Re, C, Cu and Ir; and

a second electrode layer laminated on the first electrode and including a Ni-X solid solution.

6. The thin film electrode according to claim 5, further comprising a third electrode layer laminated on the second electrode layer and including at least one element selected from the group consisting of Al, Ag and Rh.

7. The thin film electrode according to claim 5, further comprising a third electrode layer laminated on the second electrode layer and including at least one compound selected from the group consisting of transparent conductive oxides and transparent conductive nitrides, and a fourth electrode layer laminated on the third electrode layer and including at least one element selected from the group consisting of Al, Ag and Rh.

8. A thin film electrode for forming an ohmic contact in

light emitting diodes or laser diodes, comprising:

a first electrode layer laminated on a p-type gallium nitride layer and including a Ni-X solid solution; and

a second electrode layer laminated on the first electrode and including at least one compound selected from the group consisting of transparent conductive oxides and transparent conductive nitrides.

9. The thin film electrode according to claim 8, further comprising a third electrode layer laminated on the second electrode layer and including at least one element selected from the group consisting of Al, Ag and Rh.

10. A thin film electrode for forming an ohmic contact in light emitting diodes or laser diodes, comprising:

a first electrode layer laminated on a p-type gallium nitride layer and including a Ni-X solid solution; and

a second electrode layer laminated on the first electrode and including at least one element selected from the group consisting of Al, Ag and Rh.

11. The thin film electrode according to claim 1, wherein the Ni-based (Ni-X) solid solution includes nickel (Ni) as a matrix metal, and X including at least one element selected from the group consisting of group II elements, group

VI elements, Sc, Y, Ge, Sn and Sb.

12. The thin film electrode according to claim 11,
wherein the group II elements include one element selected
5 from the group consisting of Mg, Be, Ca and Zn.

13. The thin film electrode according to claim 11,
wherein the group VI elements include one element selected
from the group consisting of S, Se and Te.

14. The thin film electrode according to claim 11,
wherein the X element constituting the Ni-based (Ni-X) solid
solution is added in the amount of 1~49 atomic percent (%).

15 15. The thin film electrode according to claim 1,
wherein the electrode layers formed from the Ni-based solid
solution have a thickness of 1~1,000Å, and the first, the
second, the third, and the fourth electrode layers have an
overall thickness of 1~10,000Å.

20 16. The thin film electrode according to claim 1,
wherein the p-type gallium nitride has a composition of
 $\text{Al}_x\text{In}_y\text{Ga}_z\text{N}$ (where $0 < x < 1$, $0 < y < 1$, $0 < z < 1$, and $x + y +$
 $z = 1$).

17. A method for fabricating a thin film electrode on the p-type gallium nitride layer, comprising the steps of:

washing carbon and oxygen layers formed on a gallium nitride semiconductor to remove impurities therefrom;

5 depositing a nickel-based solid solution under a high vacuum of $2 \times 10^{-6} \sim 5 \times 10^{-8}$ torr using an electron beam evaporation, an electron ray evaporation, a sputtering process, a plasma laser deposition or an electrochemical process; and

10 annealing the deposited nickel-based solid solution under air, oxygen or nitrogen atmosphere at $250 \sim 800^{\circ}\text{C}$ for 30 seconds \sim 1 hour.

15

20

25